Bell & Howell
FILMOSOUND

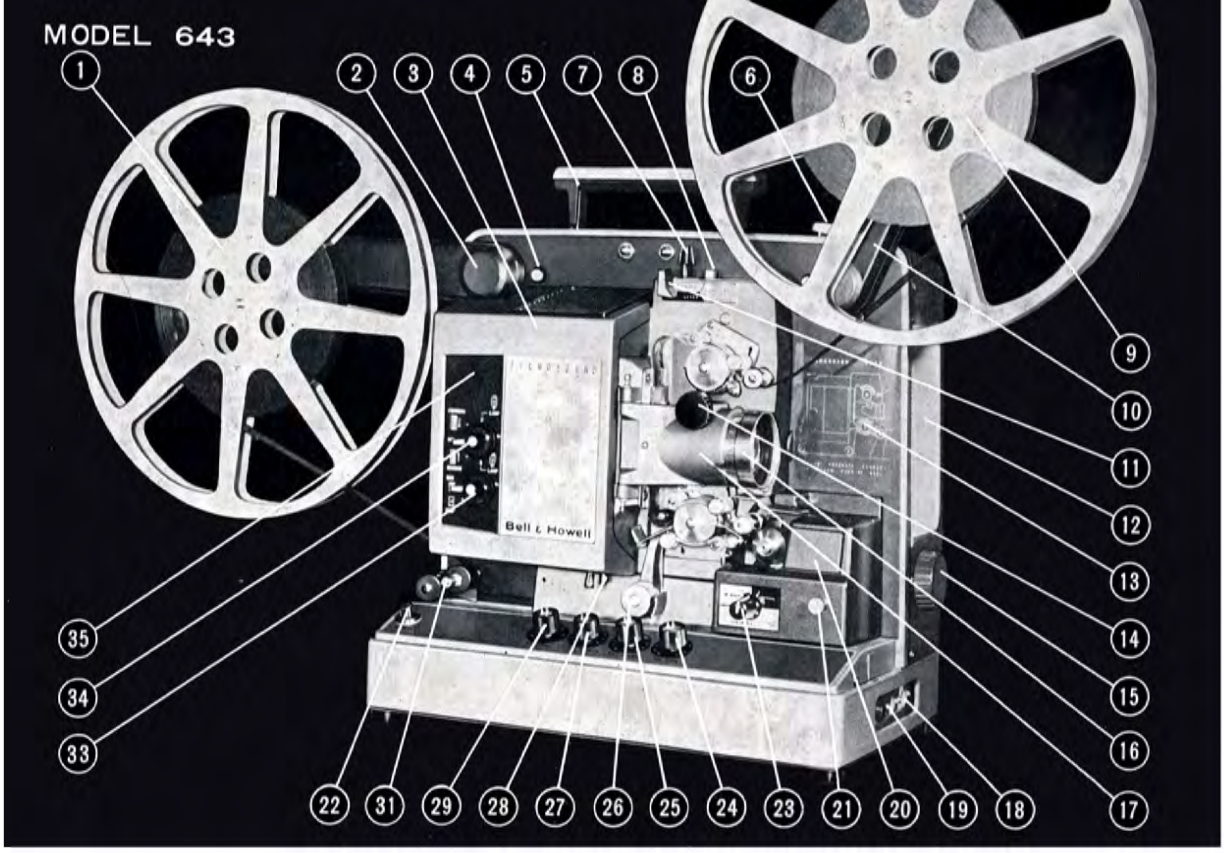
16 mm. Sound Projector

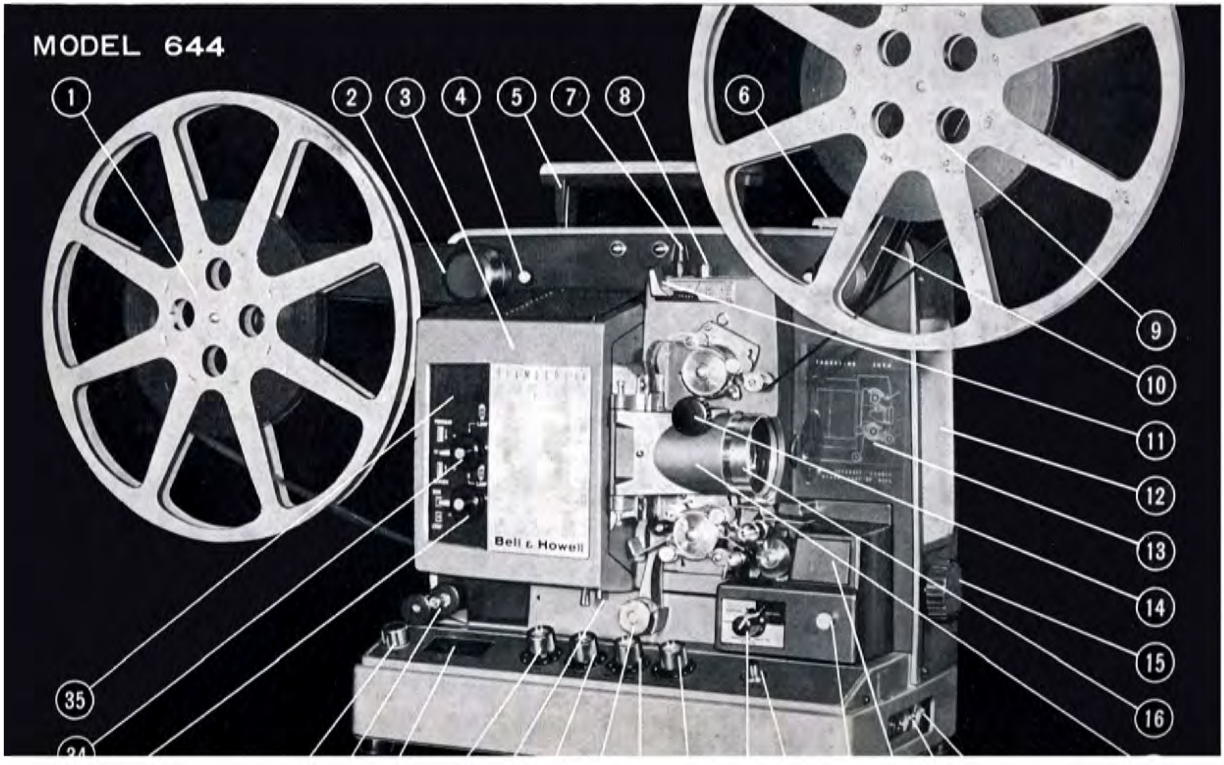
INSTRUCTION MANUAL
Betriebsanleitung
Manuel d'Instruction

Model 643 and 644 

FILMOSOUND MODEL 643 and 644

1. Take-up Reel
2. Rear Reel Arm
3. Lamphouse Cover
4. Arm Release Button
5. Carrying Handle
6. Cover Latch Button
7. Framing Control
8. Rewind Button
9. Feed Reel
10. Front Reel Arm
11. Speed Selector
12. Speaker
13. Threading Diagram
14. Focusing Knob
15. Tilt Control
16. Projector Lens
17. Lens Mount
18. Accessory Speaker Outputs
19. Microphone Input
20. Exciter Lamp Cover
21. Securing Screw
22. Animation Button
23. Selector Switch (mag/opt)
24. Optical Volume Control
25. Mag/Mic Volume Control
26. Guide Roller
27. Treble Control
28. Lamphouse Lock Button
29. Bass Control/amp. switch
30. Record Level Indicator (644 only)
31. Snubber
32. Record Button (644 only)
33. Still Picture Control
34. Direction Switch
35. Control Panel


MODEL 643
1
2
3
4
5
7
8
6
9
10
11
12
13
14
15
16
17
18
19
20
21
23
24
25
26
27
28
29
31
22
33
34
35
Bell & Howell


MODEL 644
1
2
3
4
5
7
8
6
9
10
11
12
13
14
15
16
35
Bell & Howell

You are now the owner of a BELL AND HOWELL FILMOSOUND and, in your own interests, it is important that you should register your equipment without loss of time. To do this, fill in the registration card, which you will find overleaf, detach it and post it to us within seven days of the date of purchase of the equipment. You will receive an acknowledgement of receipt by return of post. Prompt registration will not only record your ownership of the equipment and entitle you to the protection of our guarantee, but may also assist materially in its recovery if it is lost or stolen.

IMPORTANT

The model and serial number of your equipment must always be quoted in all correspondence, claims, etc. These will be found on the name-plate situated on the back cover of the projector immediately above the power input receptacle (arrowed in the illustration).

GUARANTEE

This Bell & Howell product is guaranteed to be free from defects in materials and workmanship for one year from date of original purchase.
Should, in our opinion, any part of this equipment be defective in materials or workmanship it will be replaced or repaired free of charge (except for carriage), provided the equipment has been operated according to the instructions accompanying it.

This guarantee and undertaking does not extend to projection lamps or valves or other proprietary articles, which normally will be guaranteed by the manufacturer concerned.

No liability is assumed for damage to film, and no liability is assumed for loss, damages or expenses resulting from interruptions in the operation of equipment.

This guarantee and undertaking is only in favour of the initial retail purchaser. It is void : -

(a) If the equipment has not been registered by completing the accompanying registration card and returning it within seven days, in the case of a purchase in the United Kingdom to The Rank Organization or, in the case of a purchase elsewhere, to the accredited overseas agents of Bell & Howell, within 21 days of the date of original purchase.

(b) If in our opinion the equipment has been damaged by accident, misuse or negligent handling or operation.

(c) If the equipment has been altered, repaired or serviced by other than approved Service Agents appointed by Bell & Howell.

(d) If adaptations or accessories other than those manufactured by Bell & Howel I have been made or attached.

BELL & HOWELL LTD.
Photo Products Division
Great West House, Great West Road
Brentford Middlesex, England.

FILMOSOUND 643 & 644

GENERAL INFORMATION

Before attempting to operate the Filmosound projector it is advisable to study carefully the instructions provided in this manual. An initial examination of the key illustration inside of the front cover is particularly recommended as this will enable the user to become familiar with the names and location of the various controls referred to at an early stage.

Note that current models may differ slightly in appearance from the machines illustrated throughout the manual. Except where stated the slight changes involved do not affect the operating instructions.

Queries arising from the operation of this equipment will be gladly dealt with by the Accredited Bell & Howell agent who supplied the machine.

If it is intended that the equipment be used by more than one person,it is recommended that this instruction manual be kept with the projector at all times.

Should further copies of the manual be required for distribution to individuals concerned with the operation of the equipment these may be obtained from the manufacturer.

CONTENTS

TECHNICAL DATA

	MODEL 644	MODEL 643
Operating Voltage	200/250 volts, 50 cycles, A.C. only (Transformers available for alternative A.C. supplies)	
Projector Lamp	Proximity Reflector type, 200 to 250 volts-750 watts (A1/206) or 1,000 watts (A1/207). (115 volts--750, 1,000 or 1,200 watts with accessory transformer).	
Exciter Lamp	Pre-aligned 6 volts 1 amp. (Part number 31631)	
Control Panel Lamp	6 volts 3 watts (Part number 432149)	
Valves	6B Q5/EL84 (3) 6F G6/EM 84 12A X7/ECC 83 12A U7/ECC 82 6267/EF 86 (3)	6B Q5/EL 84 (3) 12A X7/ECC 83 6267/EF 86 (3)
Photo Cell	Silicon photo cell (Part number 432029)	
Magnetic Sound	Recording and Reproduction	Reproduction
Fuse	2 amp. Time-lag 5 mm × 20 mm	
Amplifier Output	15 watts	
Output Load Impedance	8 OR 16 ohms	
Dimensions	Length 15⅞ inches (40.8cm) Width 9¾ inches (24.7cm) Height 15½ inches (39.4cm)	
Weight	approx. 41 lbs. (18.6kg)	39 ½ lbs. (18.0 kg)

ELECTRICAL CONNECTIONS

The equipment is designed for use direct from alternating current supplies of 50 cycles per second within a voltage range of 200 to 250.

Other A.C. voltage can be accommodated by the use of accessory transformers, details of which are provided in Section 11 of the manual. Before making any electrical connections it is essential to check the voltage and type of supply from which it is desired to run the equipment and if doubt exists it is advisable to consult the local electricity supply authority.

The Voltage Selector, which is located within the lamp-house must be adjusted to suit the supply before the pro-jefctor is connected to it.

To make this adjustment first fully raise the Rear Reel Arm, press upwards on the Lamphouse Lock Button and swing the Lamphouse Cover to the left to open it. Lift the Voltage Selector Plug, rotate it until the appropriate voltage group (200-210, 220-230, or 240-250) is centrally aligned with the indicator arrow, then push it down until it is firmly seated. Close the Lamphouse Cover.

The three wires at the end of the mains lead should now be connected to a suitable earthed mains connector similar to the types illustrated, as follows :

GREEN WIRE to large (Earth) pin.
BLACK WIRE to Neutral pin
RED WIRE to Live pin

To assist identification, certain plugs have these positions marked with the letters E(Earth), N(Neutral), and L (Line), and with the typ of fused plug shown, the cartridge fuse is located in the live lead.

CAUTION. Always make connections secure and avoid loose strands of wire which could possibly create a short circuit.

PRELIMINARY TEST

Initially, all controls should be in the 'OFF' position and the still Picture Control should be set to 'Run'. The Mag./ Microphone and Optical Volume Controls should be at the zero position.

Plug the mains lead in to the input receptacle at the rear of the projector (due to its design it cannot be incorrectly located), and connect the end which terminates with the three-pin plug to the mains supply socket. Switch on the mains supply.

The Control Panel will be illuminated immediately and the amplifier energized. Switch on the amplifier and exciter lamp by turning the Bass Control clockwise.

Set the Selector switch to position 3.

Turn up the Optical Volume Control until circuit noise is audible from the Speaker to confirm that the sound system is functioning, then return this control to the zero position.

Turn the Direction Switch clockwise one stepto run the projector and then clockwise a second step to switch on the Projector Lamp.

Set the Speed Selector to the appropriate position (Sound or Silent) for the type of film to be projected. The pointed section of this control should be aligned with the selected speed.

NOTE: *Do not attempt to alter the setting of the Speed Selector unless the projector is running.*

Rotate the focusing knob in either direction until a sharply defined outline of the illuminated picture aperture is visible on the screen, moving the projector stand bodily if necessary for lateral adjustment and using the Tilt Control to give the desired elevation until the outline completely covers the screen and preferably overlaps slightly on to the black masking.

It may be necessary to alter the distance between projector and screen to achieve the desired picture size, or alternatively, to substitute a lens of suitable focal length as indicated by the projection tables under Section 17. When the correct position has been thus established, return the Direction Switch to 'Off'.

The projector is now ready for threading the film.

THREADING THE FILM

NOTE : *Before attempting to thread the film, ensure that the Selector Switch is set to position 3. (See Section 6).*

To illuminate the threading path in a darkened room, open the hinged flap at the front of the Exciter Lamp Housing.

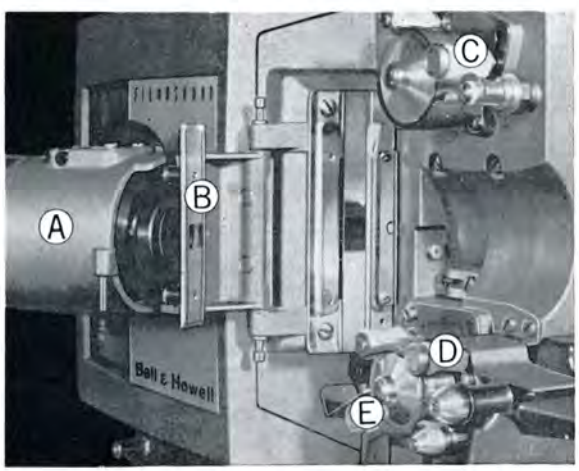
Examine the reel of film to be projected. If this is correctly wound, the perforations should be nearest to the operator when the reel is placed in position on the Front Reel Arm spindle with the film leaving the reel from the top in a clockwise direction, as illustrated. This applies to single perforated film with either optical or magnetic sound tracks, or with combined magnetic/optical tracks. As an additional check the image on the film in this position should be inverted and laterally reversed when viewed in the direction of the screen.

Where double perforated film is to be used this condition should be established by examining the film before threading. (See Section 20 'The Film'.)

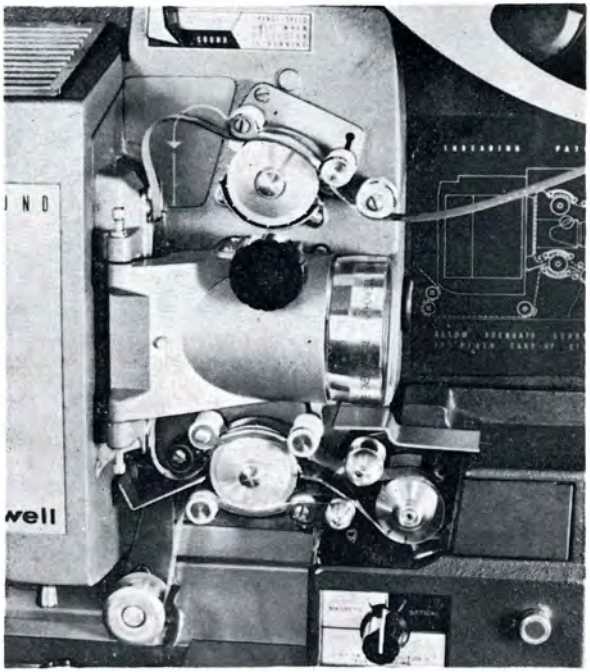
Place the reel of film on the Front Reel Arm spindle, supporting the arm and exerting pressure on the reel until it is held securely in position by the spring ball retainer on the spindle. Unwind approximately five feet of film from the reel.

Grasp the Lens Mount (A) and pull away from the projector to swing the Lens and Pressure Shoe assembly (B) open.

Open the three Sprocket Guards by exerting pressure on the Release Buttons (C), (D), (E). (Inward and upward pressure on the first two buttons — inward and downward on the third) as illustrated overleaf.

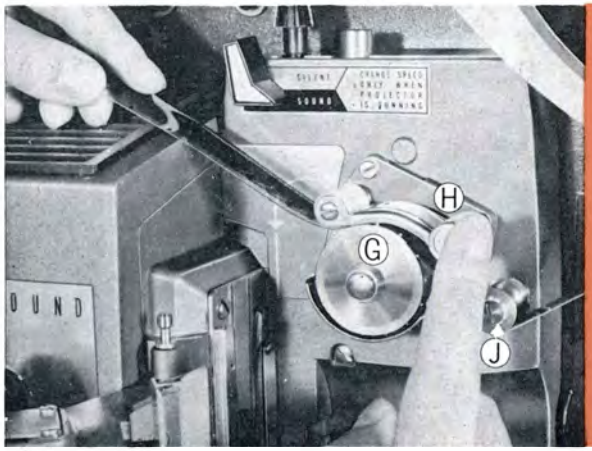


CAUTION : *The use of small film reels (50 or 100 ft. capacity) is not recommended. When it is necessary to screen short lengths of film they should first be wound on to the standard 400 ft. reels before threading.*



Follow the threading diagram printed on the front of tne machine and if necessary refer to the illustration on the right showing the machine threaded.

Guide the film under the Front Roller (J) and on top of the Upper Sprocket (G) engaging the film perforations on the sprocket teeth. Close the First Sprocket Guard (H).



Locate the film on the Aperture Plate (K) exerting side pressure with the edge of the film on the Spring Guide Rail (M) so that the film is held evenly between both Fixed (L) and Spring Guide Rails. Form a loop with the film corresponding with the guide line marked on the projector casing. Maintain this loop and close the Lens Mount so that the Pressure Shoe lies perfectly flat between the Guide Rails.

Thread the film under the Loop Restorer (N) (with very little clearance between the film and the loop restoring arm) and over the top of the Lower Sprocket (O) ensuring that the film perforations correctly engage the sprocket teeth. Press inward and downward to close the Second Sprocket Guard. (P).

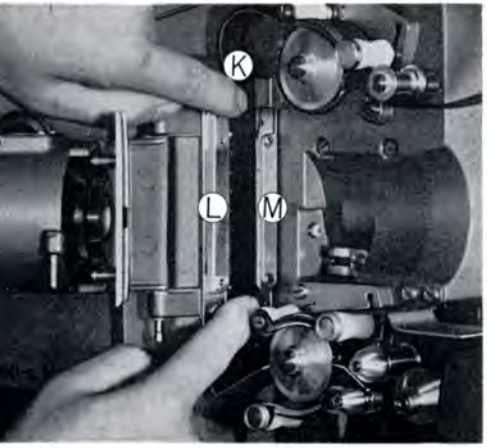
Guide the film under the Upper Stabilizer (Q), around the Sound Drum (R), over the top of the Lower Stabilizer (U), under the Lower Sprocket and under the two Guide Rollers (S), but at this stage do not engage the film perforations on the Lower Sprocket Teeth. For perfect sound reproduction it is now necessary to tension the film on the Sound Drum as follows.

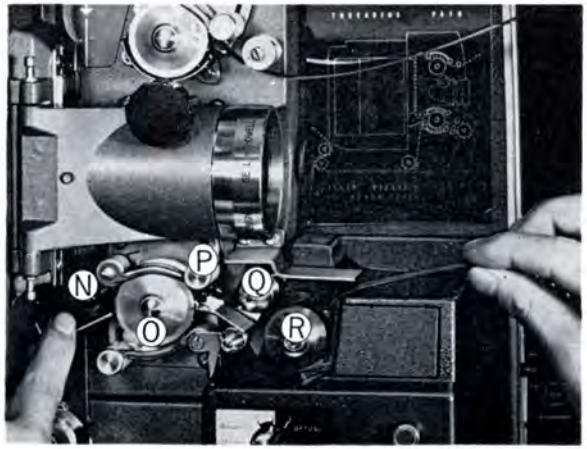
Pull the film firmly towards the rear of the projector until the Stabilizers open to their extreme position, then slowly release tension to permit the Stabilizers to pull the film back to the first available set of perforations that will engage the sprocket teeth and then close the Third Sprocket Guard (T).

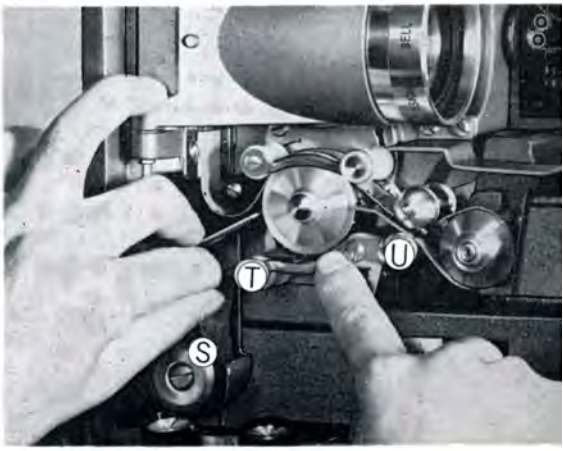
Lead the film under the Guide Roller and around the snubber rollers (see threading diagram) to the Take-up Reel. Locate the end of the film in the slot of the reel hub and rotate this clockwise to take up slack film.

INCHING KNOB

Before switching on the projector it is advisable to check for correct threading by rotating the Inching Knob in an anti-clockwise direction to move the film through the film gate. If correctly threaded, the film should track smoothly and evenly through the sprockets and gate with both upper and lower film loops maintained in their original positions. Loss of either film loop will necessitate re-positioning of the film along the threading path and repeating the inching operation until the correct condition is achieved.







OPERATION

OPTICAL SOUND FILM

Check that the Speed Selector is set to the 'Sound' position and the Selector Switch to position 3. Remember that if it is necessary to alter the speed setting the projector must be running.

Set the 'Still' Picture Control to 'Run' and all amplifier controls to the zero position.

Start the projector as previously described and focus the picture as soon as an image appears. Simultaneously advance the Optical Volume Control until a sound level is obtained which will permit comfortable and clear reception from any point in the auditorium.

Adjust the Bass and Treble controls for maximum fidelity of sound reproduction.

Sound reproduction will vary according to the acoustic characteristics of the location in which the equipment is being used, but judicious use of both Tone and Volume controls will help to overcome adverse conditions due to poor acoustics.

If the picture appears cut off at the top or bottom of the screen, turn the Framing Control in either direction until the picture is correctly framed.

As the 'End' title appears on the screen, switch off the projector lamp and turn down the volume as soon as the narration ceases. Allow the remainder of the film 'tail leader' to run through the projector on to the take-up reel before moving the Direction Switch to 'Off'.

SILENT FILM PROJECTION

Switch on the projector momentarily to set the Speed Selector to 'Silent'. Switch off and thread the film in the normal manner. Unless a microphone or record player is used to provide commentary or musical accompaniment, all amplifier controls should be set at the zero position. All other operations are as described for sound film projection.

FILMOSOUND 644

IMPORTANT NOTE

When using the edge stripe head for recording or playback the Selector Switch should first be set to Position 3, (Optical) before starting the projector and then to Position 1 (Magnetic ¼ track) immediately after switching on. This procedure will eliminate any tendency for the film to run off track during the initial starting phase.

It should be noted that this sequence of operation also applies when recording or playback is resumed after the projector has been stopped by means of the Still Picture Control or the Direction Switch.

MAGNETIC SOUND FILM CONTROLS

The controls associated with magnetic recording and reproduction are simple to operate and few in number. It should be noted, however, that magnetic operation is possible only with the magnetic head plug in place. The Filmosound 644 and 643 is supplied with a Full track head plug as standard equipment. A quarter track head plug (see section 20) can be supplied as an accessory. (also half track head) 643 is available for reproduction only.

MAGNETIC HEAD PLUG *(Insertion and Removal)*

To insert the magnetic head plug, first detach the Exciter Lamp Cover which is held in place by the captive Securing Screw. Hold the Head Plug (6), as illustrated and locate it between the Sound Drum (1) and Head Plug Bracket (4) with the Stud (5) pointing to the right. Engage the hole at the rear of the Head Plug on the Locating Pin (2), push inward as far as possible, then turn fully clockwise. Release pressure on the Head Plug and allow it to locate under the influence of the Spring Loaded Plunger (3). Replace the Exciter Lamp Cover.

It is important to ensure that the Head Plug is correctly located.

For removal, detach the Exciter Lamp Cover, press inward on the Head Plug, turn it fully anti-clockwise and withdraw.

SELECTOR SWITCH

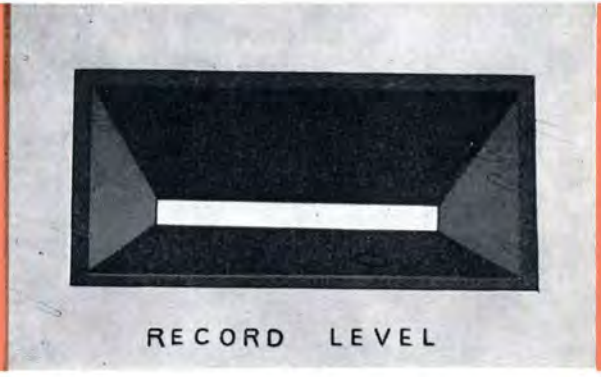
With the Magnetic Head Plug in place the Selector Switch must be set to a position appropriate to the track width in use (see section 20).

The three positions of the switch are as follows :
Position 1. (with Quarter track head plug in position).
For reproduction or recording of Quarter stripe magnetic sound tracks on double-perforated film.
Position 2. (with Full track head in position).
For reproduction or recording of Full stripe and Half stripe magnetic sound tracks on single perforated film.
Position 3. For reproduction of Optical sound tracks and for Public Address operation.

NOTE :
In both magnetic positions of the Selector Switch a metal skate lies close to the magnetic head. To facilitate threading in the vicinity of the sound drum, this skate should be moved downward and clear of the head by turning the Selector Switch to position 3. On completion of threading, the switch can then be set to the required position.

MAG./MIC. VOLUME CONTROL

Operation of this control varies the level of the signals which are passed through the pre-amplifier from the magnetic head when reproducing a magnetic sound track, and from the microphone input on 'Record' or for Public Address operation.



RECORD SWITCH (644 ONLY)

Recording is possible only when the projector is running with the Direction Switch in the 'Forward' position and the Selector Switch in either of the two magnetic positions. Pressure on the 'Record' switch then energises a relay which in turn switches on the recording circuits. Immediately the projector is switched off the relay is de-energised and the circuits disconnected. The film, may, however, be stopped at any point without affecting the recording condition, by moving the Still Picture Control to 'Stop'.

RECORDING LEVEL INDICATOR (644 ONLY)

With the recording circuits functioning the Recording Level Indicator appears as two illuminated strips, forming between them a central gap.

When signals are fed through the recording circuits to the magnetic head, this gap varies in width to an extent governed by the level of the recording signals, an overload condition occuring when the gap completely closes. In recording a sound track, the aim should be to achieve the highest recording level possible without distortion being apparent when the track is reproduced. The Mag./Mic. Volume Control should therefore be set to a position at which the Recording Level Indicator shows maximum response, the gap reducing to a minimum without closing completely. This condition should be maintained for most of the recording but the gap wil lclose occasionally during periods of very short duration corresponding with particularly loud passages of the signals being recorded.

MAGNETIC SOUND TRACK REPRODUCTION

With the Magnetic Head Plug in place, set the Selector Switch to position 3 and thread the film in the manner previously described. After threading, move the switch to the required track position (See 'Recording Techniques' section 20).

Set the Optical Volume Control to zero and with the amplifier Switch on, start projection in the normal manner, using the Mag./Mic Volume Control to adjust the level of the sound output as required. The Bass and Treble Controls should be adjusted as necessary for optimum sound quality.

It should be noted that, with the Full Track head in use, combined optical and magnetic half stripe sound tracks can be reproduced simultaneously, the output levels of each being controlled by their respective volume controls.

MAGNETIC SOUND RECORDING (644 ONLY)

Before a film can be used for recording a magnetic sound track, it must contain a magnetic 'stripe'. The stripe consists of a magnetic material similar to that used on recording tape, which is applied to the surface of the film farthest away from the lens during projection. It can be applied in different widths, and when a recording has been made upon it, the magnetic sound track so produced can be used instead of, or to supplement, the existing optical sound track. The stripe is very hard wearing and is unaffected by normal cleaning fluids. A faulty recording can be erased and re-recording carried out as often as required.

Important : *Films with magnetic sound tracks should never be stored in the accessory speaker case or close to equipment which generates a magnetic field (transformers etc.) as this may result in partial erasure of the recorded sound.*

Before attempting to make a full scale recording, it is advisable to carry out one or more short test runs. This will assist in establishing a suitable recording level and will also enable the user to become familiar with the operating procedure.

To record a magnetic sound track, proceed as follows : With the magnetic head in place, Set the Selector Switch to position 3 and thread the film in the manner previously described, then move the Selector Switch to one of the two magnetic positions according to the track width in use.

Set the Still Picture Control to 'Stop'.

Switch on the amplifier.

Set the Optical Volume Control to zero.

Connect the microphone to the Microphone Input Socket.

Turn the Direction Switch to the 'Forward' position to start the projector motor.

Depress the Record Button and notice that almost immediately the Recording Level Indicator will illuminate, indicating that the recording circuits are ready for operation.

Speak into the microphone and advance the Mag./Mic. Volume Control until the Recording Level Indicator shows a marked response to the spoken commentary. This will indicate that signals are being fed to the Magnetic Recording Head.

Adjust the Mag./Mic. Volume Control until the Recording Level Indicator shows maximum response as previously described.

When the recording signal level has been thus established start the film in motion by turning the Still Picture Control to 'Run' and commence the recording.

More detailed information on recording is provided later in the manual under 'Recording Techniques', (section 20).

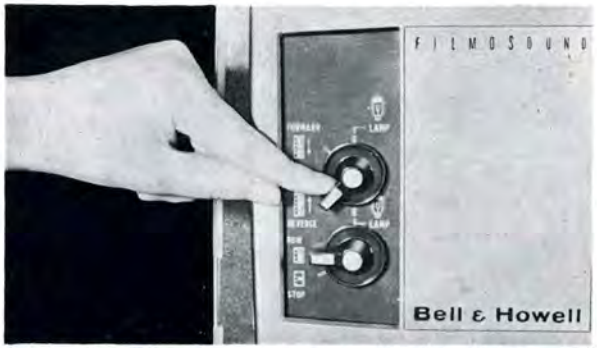
On completion of the recording, turn the Mag./Mic. Volume Control to zero before switching off the projector.

To reproduce the recording, rewind the film and carry out the operations described under 'Magnetic Sound Track Reproduction'.

A recording can be completely erased when required simply by running the film through the machine with the controls set for the recording operation, but with the mag/mic; volume control at zero, or with the microphone disconnected. An existing recording is automatically erased as a new recording is made on the same track.

STILL PICTURE PROJECTION

To project a still picture, the film can be stopped at any time by switching the Still Picture Control to 'Stop'. Immediately this control is operated a solenoid-actuated safety screen is brought into position between the lamp and the film to protect the film from heat damage. Because of this, there will be a noticeable decrease in picture brilliance. It will be necessary to adjust the lens for sharp focus with a still picture. Re-focus as soon as normal projection is resumed. With the Still Picture Control at 'Stop', the Animation Button can be depressed to advance the film as necessary. This facility operates on the 'Forward' or 'Reverse' setting of the Direction Switch.

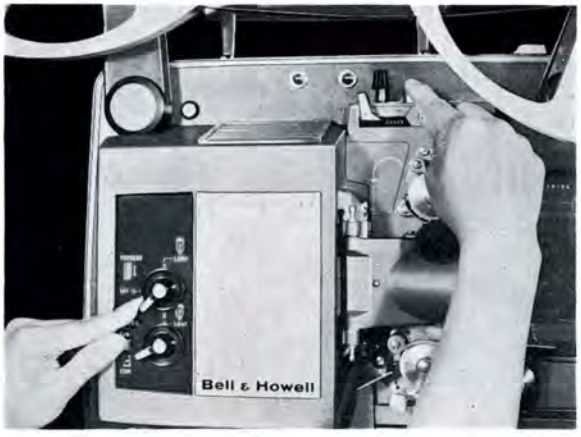


REVERSE PROJECTION

To reverse the direction of the film through the projector, turn the Direction Switch anti-clockwise to 'Reverse', pausing momentarily at the 'Off' position. It is not advisable to turn the switch direct from 'Forward' to 'Reverse' without pause. Further movement of the switch in the same direction will switch on the lamp.

During reverse projection of sound film the Volume Controls should be set at zero to eliminate unintelligible noise. On resuming normal forward projection, remember to advance the appropriate Volume Control to the required setting.

REWINDING



When projection is completed and the entire film has passed through the projector on to the take-up reel, turn the Direction Switch to 'Off'. Firmly grasp the Rear Reel Arm with the left hand and swing the arm up to the vertical position. Lead the film from the take-up reel to the bottom of the feed reel and engage the end of the film in the slot of the reel hub. Rotate the reel in an anti-clockwise direction to take up slack film and wind two or three turns on to the reel manually.

Turn the direction switch to 'Reverse', press and hold down momentarily Rewind Button to start rewinding.

Switch off the projector as soon as this operation is completed, press the Arm Release Button, and return the Rear Reel Arm to the normal operating position.

Warning : *It is important to ensure that the Rear Reel Arm is returned to the correct position for normal projection. Failure to do so may result in damage to the film.*

PUBLIC ADDRESS SYSTEM

MICROPHONE

The microphone provided with the equipment for recording purposes (part number 041500) is also suitable for use with the Filmosound projector amplifier to provide a first class public address system or to supply a commentary to silent films. The microphone should be connected to the Microphone Input Socket and the Mag./Mic. Volume Control advanced to a position just below the point at which the system 'howls'. In cases where intermittent 'howling' occurs while speaking into the microphone, it may be necessary to retard the volume control slightly and to adjust the Tone Controls until a stable condition is achieved. See section 20 - 'Accessries'.

RECORD PLAYER

Any good quality record player incorporating either a crystal or a high impedance magnetic pick-up with an output not exceeding 200 millivolts may be used to reproduce through the amplifier. The plug from the pick-up should be connected to the microphone input socket and the volume controlled by means of the Mag./Mic. Volume control on the projector. If a volume control is fitted to the record player this can be initially set at the minimum position necessary to provide a suitable signal level through to the projector amplifier. It is important to ensure that the equipment is earthed to avoid the possibility of mains hum interference. See section 20 - 'Accessories'.

ACCESSORY SPEAKER

(Part No. 6001) Filmosound projectors incorporate a specially matched 6-inch elliptical speaker to provide adequate performance for the smaller auditorium. For the larger hall where greater sound volume is necessary, the accessory speaker should be used to ensure first class sound reproduction. This 12-inch, 16 ohm speaker is supplied complete with a 50 foot speech lead terminating in a special 3-pole plug for connecting to the speaker output socket on the machine. Connection of the accessory speaker automatically disconnects the built-in speaker. When a single accessory speaker is used it should be plugged in to the '16 ohm' socket on the projector. The socket marked '8 ohm' is for use with dual accessory speakers connected in parallel.

A single speaker should normally be located in front of the screen either centrally or at one side and preferably high—at least above audience ear level, if possible directed downward towards the centre of the auditorium. Dual speakers should be similarly positioned with one at each side of the screen. Unless a perforated screen is used speakers should never be placed behind the screen.

Every possible care should be taken to locate the speech lead so that it cannot be accidentally pulled by the feet of the audience, resulting in an interruption in the programme or even damage to the equipment.

ALTERNATIVE POWER SUPPLIES

The transformer units described here are not included with the basic equipment, but are available as accessory items at extra cost.

1.5 KVA TRANSFORMER UNIT

(Part number 026704)

This transformer is designed for use where the mains supply is 190/250 volts, 50 cycles alternating current only. It supplies the standard 240 volts necessary to operate the projector mechanism and 115 volts to the projector lamp. The provision of a four-position selector switch permits a slight variation in the lamp operating voltage above and below the optimum 115 volts, the position of which is indicated by a heavy black line in the centre of the voltmeter scale.

Warning. The slightest increase in the lamp operating voltage will seriously curtail the rated life of the lamp. It is, therefore, important to ensure that the meter needle never exceeds the 115 volt reading unless it is considered that the extra light output gained justifies the reduction in lamp in life.

BEFORE CONNECTING TO THE MAINS SUPPLY

It is essential that the tapping screw (C) is set for the correct mains input voltage. Select the tapping which includes the voltage of your local supply (if this falls between two of the marked ranges, choose the higher) and insert the screw in that position. The transformer is now ready to be connected to the projector.

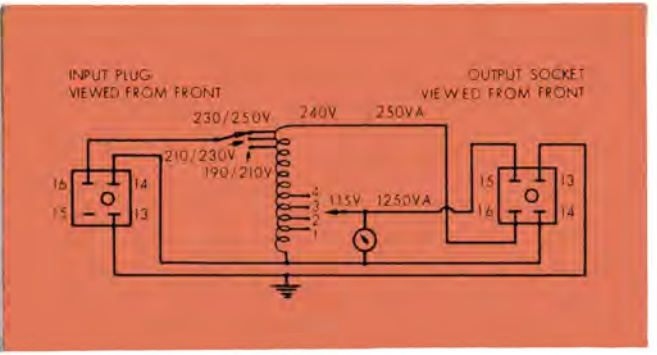
Take the 6 ft. lead (209001) and plug one end into the matching transformer output (B) then connect the other end to the input plug on the projector. Confirm that the projector voltage selector is set to 240 volts.

The matching end of the 25 ft. mains lead (026496) should then be attached to the transformer input plug (A) and the free end connected to a suitable 3 pin plug by securing the red and black wires to the smaller points in the mains plug and the green wire to the larger earth pin.

If your power supply is from 2 pin sockets, then the green wire must be connected to a suitable earth point. If in doubt, consult a qualified electrician.

Connect the equipment to the mains supply, switch on the projector motor and lamp, and by means of the selector switch, align the voltmeter needle with the 115 volt mark. If the needle is to the right of the mark, turn the selector switch anti-clockwise to reduce voltage — if to the left, increase voltage by turning the switch clockwise.

If the meter needle fails to reach the 115 volt mark at the highest position (No. 4) of the selector switch, it will be necessary to disconnect the unit from the mains supply, reset the tapping screw to the next lower voltage range, and repeat the operations already described.



CARE AND MAINTENANCE

The Filmosound range of 16 mm projectors is built to the highest standards of quality and precision for which Bell & Howell are world famous. Component parts of the projector are specially designed by expert craftsmen and constructed of selected, high grade materials to give maximum performance with negligible maintenance. If any part receives damage, thus requiring replacement, this can be carried out economically and in the minimum time due to the unit construction system employed in the design of the projector.

A nation-wide chain of Bell and Howell Accredited Service Agents staffed by factory trained technicians provides complete facilities for the repair and testing of all Filmosound equipment.

PERMANENT LUBRICATION

Filmosound projectors employ the exclusive Bell and Howell system of factory-sealed lubrication which eliminates the need for oiling by the user. This ensures that all parts of the mechanism receive exactly the right amount of lubrication at all times to give extended service and long life.

REMEMBER - DO NOT OIL THE PROJECTOR

It is recommended that periodical inspection and any necessary adjustment of the equipment is carried out by a Bell and Howell Accredited Service Agent as this system of protective maintenance is an economical method of ensuring that the equipment is always in first class condition.

STORING THE EQUIPMENT

Always store the projector away from conditions of excessive heat or moisture. Wherever possible keep it in a carton or other enclosure to prevent the entry of dust. Protective covers available as accessories will assist in keeping the exterior of the case free from abrasions.

PROJECTION LENS

To remove for cleaning, turn the Focusing Knob anti-clockwise until the lens protrudes as far as possible from its mount, grasp the lens and pull it out. With a good quality camel hair brush, carefully remove dust from the surfaces of the front and rear glass elements, then very lightly polish

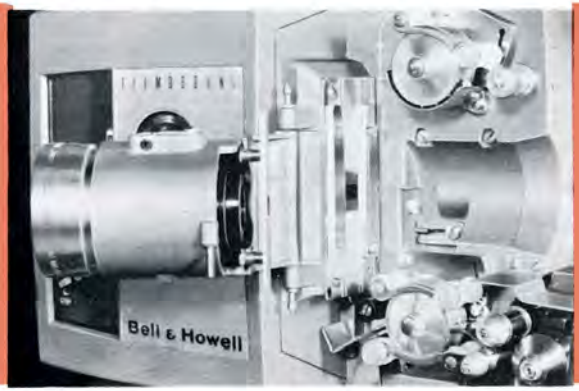
with a lens tissue or a clean, soft and lintless cloth. Avoid excessive pressure on the glass surfaces as this can sometimes cause scratching which will result in poor definition of the projected image. If marks are still present after polishing, repeat the operation using lens cleaning fluid which is obtainable from Bell and Howell dealers. When the lens is clean insert it into the mount and turn the Focusing Knob clockwise to engage.

PRESSURE SHOE AND APERTURE PALTE

Grasp the Lens Mount and swing it outward to open. Gently wipe the Pressure Shoe with a clean cloth to remove accumulated foreign matter.

Clean the Aperture Plate, Guide Rails and the edges of the picture aperture. When cleaning the Picture Aperture carefully insert the gate cleaning brush exercising extreme care to avoid undue pressure on this component.

Never attempt to carry out cleaning operations when the projector is running. If cleaning of the Pressure Shoe Aperture Plate area has not been carried out at regular



periods, it is possible that dust and emulsion deposit may accumulate in the form of a hard coating which normal methods of cleaning will fail to remove. In this case a sharpened piece of wood or plastic should be used to scrape off the deposit. NEVER USE METAL OBJECTS FOR THIS PURPOSE.

CONDENSER UNIT

To gain access to the Condenser Unit, raise the Rear Reel Arm, press upwards on the Lamphouse Lock Button and swing the Lamphouse Cover to the left. Grasp the Upper Support Lug of the unit and pull it outward, then raise it slightly to permit the bottom arm of the unit to clear the Lower Support Lug, before withdrawing it. Carefully clean the accessible glass surfaces with lens tissue or a soft clean cloth.

The lenses of the unit should never be removed from the mount. Replace the Condenser Unit by inserting the main assembly into the housing recess, locating the Bottom arm over the Lower Support Lug and pressing the Top arm into place over the Upper Support Lug. If the interior of the unit requires cleaning, it is recommended that this be carried out by a Bell and Howell Accredited Service Agent.

MAGNETIC HEAD PLUGS

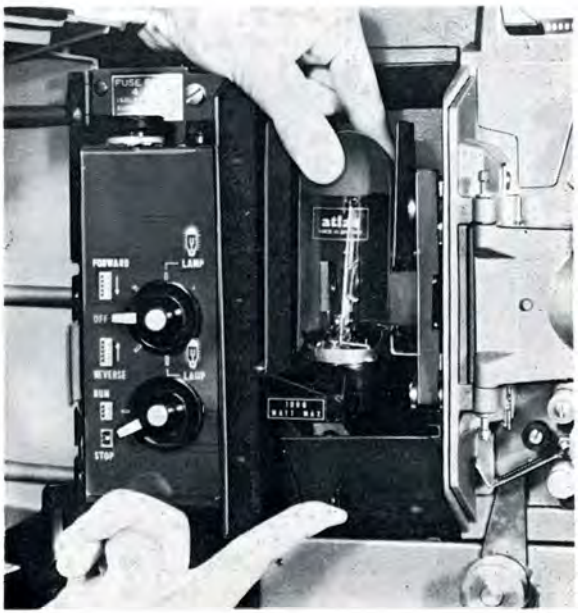
See Section 20, 'Maintenance'.

LAMP REMOVAL AND REPLACEMENT

PROJECTOR LAMP

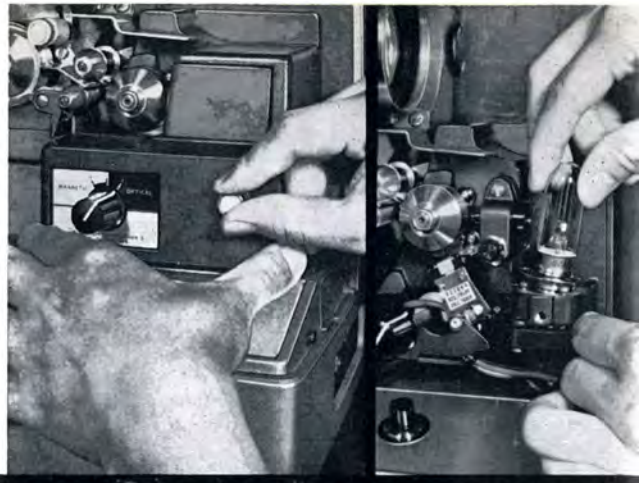
Switch off the projector and disconnect the mains supply.
Ensure that the Rear Reel Arm is fully raised.
Press the Lamphouse Lock Button to open the Lamphouse Cover.
Grasp the top of the lamp and exert upward pressure on the Lamp Ejection Lever to force the lamp from its socket. If the lamp is hot use a glove or other form of protection for the hand.
To replace the lamp, locate it in the socket and rotate it slowly until the lamp drops into position. (The lamp base is keyed and will only locate in the correct position). Press down until the lamp is firmly seated. Close the Lamphouse Cover.

WARNING: *Before removing or replacing lamps or fuses always ensure that the equipment is disconnected from the mains supply.*



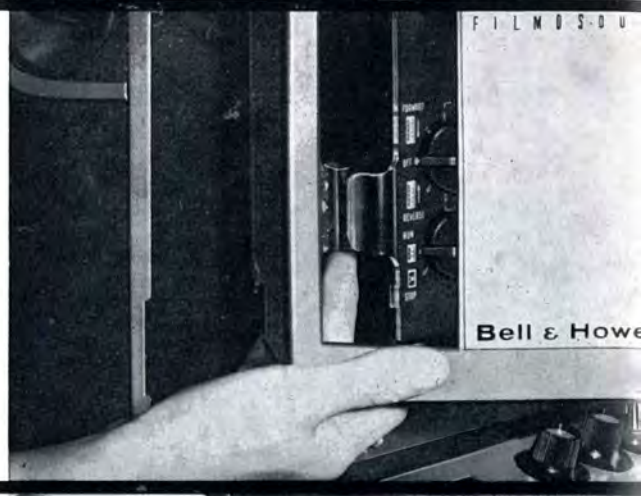
EXCITER LAMP

Loosen the securing screw holding the Exciter Lamp Cover in place and remove the cover evenly without tilting. Swing the Lamp Lock Lever right to release the lamp, then rotate the lamp until it can be removed from the guide pins. To replace, locate the new lamp over the guide pins (it will fit in only one position) then rotate clockwise until the pins reach the narrow end of the slots. Swing the Lamp Lock Lever left to lock the lamp in position. Replace the Exciter Lamp Cover by sliding it evenly into place and then tighten the securing screw.



CONTROL PANEL LAMP

Place the Rear Reel Arm in the rewind position. Open the Lamphouse Cover. The Control Panel Lamp is mounted on the left of the Lamphouse behind the Control Panel. This lamp is of the festoon type and is held between two spring metal contacts. To remove, simply ease out from the contacts. To replace, locate one end of the lamp on one of the contacts, apply slight pressure then ease the other end of the lamp into position until secure. Close the Lamphouse Cover.



FUSE REPLACEMENT

A 2 amp cartridge fuse is located next to the Voltage Selector at the top of the Lamphouse. To remove it, first ensure that the equipment is disconnected from the mains supply then press and turn the top of the fuse holder anticlockwise and lift upwards until the holder is free from its recess. Pull out the defective fuse and replace with a new one, then depress and turn the cap of the fuseholder clockwise into its socket.

Warning: *The equipment must be disconnected from the mains supply before attempting to replace a valve or carry out any adjustments within the amplifier.*

Complete access to valve positions is obtained by removal of the cover at the base of the machine after first unscrewing the four rubber feet, two screws on opposite sides of the base and one screw securing the spreader bar of the Tilt Unit.

To assist in correct location of the valves the circuit boards at the valve sockets are marked with the type reference and whenever valves are removed from their sockets care should be taken to ensure that these are replaced in the correct position.

supported by a Valve Retaining Plate secured by two screws and slotted for adjustment.

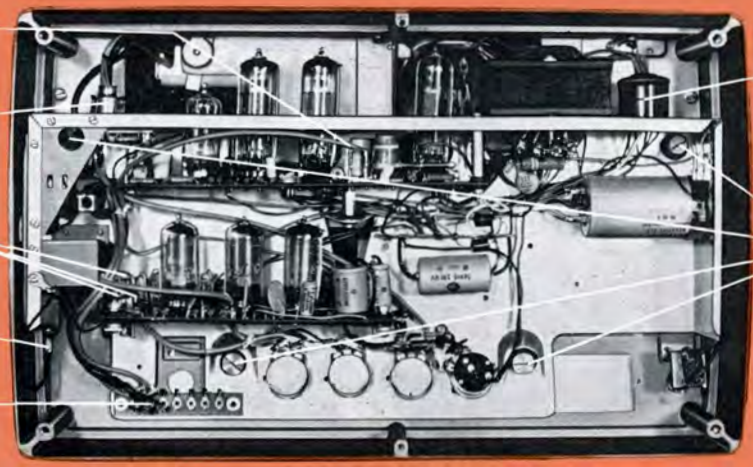
REPIACEMENT OF VALVES

If, for any reason, it is necessary to remove the complete amplifier from the projector body, proceed as follows: —

Detach the four amplifier control knobs after loosening the screws securing them in position. With the base cover removed, unscrew the plastic retaining collar which secures the record switch to its bracket in the interior of the amplifier housing (644 only). Detach the switch. Loosen and remove the hexagonal screw to free the Recording Level Indicator (644 only).

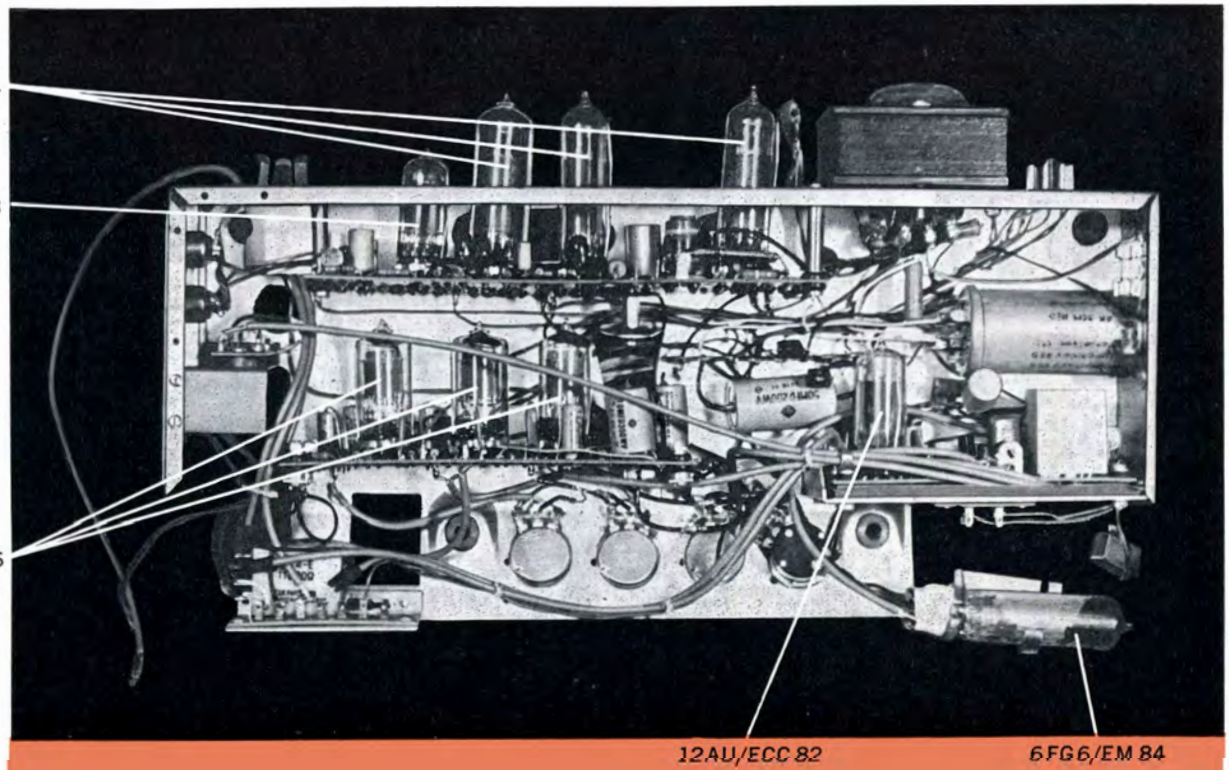
Detach the speaker leads and withdraw the 7-pin plug from its socket on the amplifier. Disconnect the Exciter Lamp and Optical pre-amplifier leads. Detach the octal plug from the socket, seven leads from tagboard 'A' and two leads from tagboard 'B' (644 only) at the bottom right of the amplifier. Detcah an earthing lug from the base by removing a screw. After removing the four screws the amplifier may then be withdrawn from within its housing. The ends of the speaker and tagboard leads terminate in miniature sockets which are a push fit on the metal contacts.

Before detaching leads from tagboards note the align-



VALVE TYPES

Although the valves used in the amplifier are readily available from most radio supply stores, for, peak performance it is recommended that replacements be obtained from a Bell and Howell Accredited Agent.



PROJECTED PICTURE SIZES

DISTANCE IN FEET FROM FILM PLANE TO SCREEN

	LENS FOCAL LENGTH						
	25 mm	32 mm	40 mm	2" 50mm	64 mm	80 mm	100 mm
8	3' 1" 2' 4"	2' 5" 1' 10"	1' 11" 1' 5"	1' 6" 1' 2"			
10	3' 11" 2' 11"	3' 0" 2' 3"	2' 5" 1' 10"	1' 11" 1' 5"	1' 6" 1' 2"		
12	4' 8" 3' 6"	3' 8" 2' 9"	2' 11" 2' 2"	2' 3" 1' 9"	1' 10" 1' 4"		
15	5' 10" 4' 4"	4' 6" 3' 5"	3' 8" 2' 9"	2' 10" 2' 1"	2' 3" 1' 9"		
20	7' 9" 5' 10"	6' 1" 4' 6"	4' 10" 3' 8"	3' 10" 2' 10"	3' 0" 2' 3"		
25	9' 8" 7' 3"	7' 7" 5' 8"	6' 1" 4' 6"	4' 9" 3' 7"	3' 9" 2' 10"	3' 0" 2' 3"	2' 5" 1' 10"
30	11' 8" 8' 10"	9' 1" 6' 10"	7' 3" 5' 5"	5' 9" 4' 3"	4' 7" 3' 5"	3' 8" 2' 9"	2' 11" 2' 2"
35	13' 7" 10' 2"	10' 7" 7' 11"	8' 6" 6' 4"	6' 8" 5' 0"	5' 4" 4' 0"	4' 3" 3' 2"	3' 5" 2' 6"
40		12' 2" 9' 1"	9' 8" 7' 3"	7' 8" 5' 9"	6' 1" 4' 6"	4' 10" 3' 8"	3' 11" 2' 11"
45		13' 8" 10' 3"	10' 11" 8' 2"	8' 7" 6' 5"	6' 10" 5' 1"	5' 5" 4' 1"	4' 4" 3' 3"
50		15' 2" 11' 4"	12' 1" 9' 1"	9' 7" 7' 2"	7' 7" 5' 8"	6' 1" 4' 6"	4' 10" 3' 8"
60			14' 7" 10' 11"	11' 6" 8' 7"	9' 1" 6' 10"	7' 3" 5' 5"	5' 10" 4' 4"
75				14' 4" 10' 9"	11' 4" 8' 6"	9' 1" 6' 10"	7' 3" 5' 5"
100					15' 2" 11' 4"	12' 1" 9' 1"	9' 8" 7' 3"
125						15' 2" 11' 4"	12' 1" 9' 1"
150							14' 7" 10' 11"

Upper dimension is width of picture
Lower dimension is height of picture

USEFUL ADVICE

The success of any film presentation depends a great deal on the preparations made prior to the commencement of screening. Generally speaking, the majority of breakdowns experienced are due to minor faults which almost certainly can be avoided by thorough, routine checking and adjustment.

Where possible, always allow plenty of time to set up the equipment, arrange seating and carry out a test run before the show so that, when the audience assembles, it will only be necessary to switch off the house lights and start the projector.

Ensure that all cables (power and speech) are securely connected and, if possible, out of reach of the audience.

Ideally, the projector on its stand, should be located well back from the rear row of seats and high enough to prevent obstruction of the picture by the heads of the audience. The projected picture should completely fill the screen and preferably overlap slightly on to the black masking. To achieve this it may be necessary to select an accessory lens of the required focal length (see Section 17).

It is advisable to keep available a spare exciter and projector lamp in case a replacement is required during projection. In addition a gate cleaning brush should be included with these spares to remove foreign matter from the picture gate aperture between reels.

Films for showing should be placed in the correct order in a convenient and accessible position.

Always check that they are correctly wound on the reels (sound film should have the perforations nearest to the operator with the film leaving clockwise from the top of the reel when in position on the reel arm).

It is unprofessional and disturbing to the audience to show the leader numbers on the screen—the hand is quite an effective mask for this. Similarly, the lens should be covered (or projector lamp switched off) at the end of the film to prevent the effect of a dazzling white screen without a picture. Always remain near the projector throughout the performance in order to make any necessary adjustments. Watch the screen closely for development of any picture defects. If scratching of the film should develop, stop the machine at once, remove the film from the gate and sprockets and trace back until the source of damage is located. Common causes of film scratch are:

(a) Dirty picture gate.
(b) Dirty or sticking rollers (intermittent scratch).
(c) Incorrect size of film loop (causing contact with parts of machine).

Perforation damage may be due to:

(a) Faulty threading (perforations not registered correctly with sprocket teeth).

(b) Bent or warped reels.

If the film should break during projection, and the break is not due to a fault of the machine, stop the projector and wind the loose end of film on to the take-up reel, then switch on to resume projection. If the film break occurs at the gate area, it will be necessary to re-thread the film. Do not attempt to repair a film which has been rented from a library, but notify the library of the damage when the film is returned.

Other films can be repaired quite simply by the use of an efficient splicer which can be obtained from all Bell and Howell dealers.

Finally, if advice, assistance or spare parts are required, a world-wide chain of Bell and Howell dealers is at your service.

EMERGENCY TROUBLE GUIDE

Defect	*Possible Cause*
EQUIPMENT DOES NOT FUNCTION	**a** Mains lead not making proper contact. **b** No current at mains socket (check with lamp or other appliance). **c** Mains fuse blown.
NO SOUND	**a** Speech lead disconnected. **b** Exciter lamp not on. **c** Volume control not advanced. **d** Film incorrectly threaded. **e** Obstruction of the sound optical system by excessive dirt or foreign matter. **f** Absence of sound record on film. Check with known film. **g** Burned out exciter lamp. **h** Fuse in lamphouse blown. **k** Valves in wrong sockets or not fully seated. **l** Defective valve.
INADEQUATE VOLUME	**a** Volume control insufficiently advanced. **b** Dirty or dense sound track on film. **c** Dirt or foreign matter obstructing sound optic. **d** Defective valves or photo-diode. **e** Defective, dirty or misaligned exciter lamp. **f** Low mains voltage.
POOR QUALITY SOUND	**a** Speed selector set in silent position. **b** Other causes under the heading 'Inadequate Volume'. Noises such as humming, oscillations, or whistling can result from defective valves, photo-diode. **c** Film incorrectly threaded. **d** Poor acoustics.
NO PICTURE	**a** Power supply disconnected. **b** Lamp not turned on. **c** Projector lamp failure.
INSUFFICIENT PICTURE BRILLIANCE	**a** Extraneous light on screen. **b** Blackened projector lamp. **c** Dirty projection lens. **d** Low mains voltage. **e** Condenser unit incorrectly fitted.
LOSS OF FILM LOOP	**a** Badly damaged film or obstruction, due to foreign matter.
FILM SCRATCHING	**a** Dirty gate or film path causing emulsion build up. Clean as instucted. **b** Inefficient film handling. Hold by edges, avoid contact with ground.

MAGNETIC FAULTS

Defect	*Possible Cause*
NO SOUND	**a, c, d, f, h, k, l,** as optical.
	1 Selector switch not in magnetic position.
	2 Head plug not making proper connection with contact block.
	3 Pre-amplifier plug disconnected from amplifier or not seated properly.
INADEQUATE VOLUME	**a, f,** as optical.
	1 Defective valve.
	2 Dirt on film.
	3 Head plug not making proper connection with contact block.
	4 Head plug not seating properly on film.
	5 Skate moved out of position.
	6 Selector switch in wrong position.
	7 Faulty pre-amplifier.
POOR QUALITY SOUND	**a, c, d,** as optical.
	1 Other causes under the heading 'Inadequate Volume' — noises such as humming, oscillation or whistling can result from defective valves.
	2 Dirt on film.
	3 Head plug not seating properly on film.
	4 Selector switch in wrong position.
	5 Skate moved out of position.
	6 Faulty pre-amplifier.

Defect	*Possible Cause*
NOT RECORDING (644 only)	**1** Selector switch not in magnetic position. **2** Head plug not making connection with contact block. **3** Record button not depressed after motor has started. **4** Projector running in reverse. **5** Volume control not advanced. **6** Faulty valve. **7** Amplifier not switched on. **8** Fuse blown.
LOW LEVEL RECORDING (644 only)	**1** Dirty or worn film. **2** Head not seated properly on film. **3** Film incorrectly threaded. **4** Head plug not making proper connection with contact block. **5** Volume control not advanced far enough. **6** Faulty valve or record level indicator. **7** Selector switch in wrong position.
DISTORTED OR POOR QUALITY RECORDING (644 only)	**1** Volume control too far advanced. **2** Input to mic. socket greater than 200 mV. **3** Faulty valve or record level indicator. **4** Selector switch in wrong position. **5** Dirty or worn film. **6** Dirt on magnetic heads. **7** Low mains voltage. **8** Skate out of position. **9** Faulty erase head.
NOT ERASING (644 only)	**1** Faulty valves. **2** Poor connection between head plug and contact block. **3** Faulty erase head.